

REMARKS

Applicants have amended their specification to correct typographical and grammatical errors on pages 4 and 16 of the specification. Specifically, the spelling of "trimethylolpropane" has been corrected on page 4, and a redundant expression "selected from" has been deleted from page 16. It is respectfully submitted that these amendments to the specification do not add new matter to the application.

Applicants have amended their claims in order to further clarify the definition of the present invention. Specifically, claim 1 has been amended to recite that the composition includes a polyvinyl acetal resin, a thermosetting resin and at least one of a polyfunctional acrylate compound and a polyfunctional methacrylate compound. Claim 1 has been further amended to recite that "when" a tracking resistance test of a cured material of the adhesive composition is carried out according to the IEC method, this method being set forth, then the adhesive layer dissolves out for the first time when five drops or more of the electrolyte are dropped thereon. In connection with the amendments to claim 1, note, for example, page 3 of Applicants' specification. In light of amendments to claim 1, claim 2 has been canceled without prejudice or disclaimer. Moreover, in light of canceling of claim 2, dependencies of claims 12-14 have been amended.

In addition, claim 3 has been amended to recite an adhesive composition

which comprises, in addition to the polyvinyl acetal resin and thermosetting resin, at least one of a polyfunctional acrylate compound and a polyfunctional methacrylate compound. Claim 3 has been further amended to define a thermogravimetric analysis after curing "the adhesive composition", reciting a 5% weight loss temperature and a carbon residual ratio at 650°C "of the cured adhesive composition". Claim 4 has been amended to delete the word "uniformly". Claim 6 has been amended in light of amendments to claim 3, and to provide the claim in more correct English. Claim 10 has been amended to be dependent on claim 7.

In addition, claims 19-21 are being added to the application. Claims 19 and 21, each dependent on claim 1 or 3, respectively recites that each of the polyfunctional acrylate or methacrylate compounds has two or more acryloyl groups or methacryloyl groups; and recites a formulation weight ratio of polyvinyl acetal resin to thermosetting resin in the composition. Note the first paragraph on page 4, and the first full paragraph on page 13, of Applicants' specification. Claim 20, dependent on claim 1, 3 or 7, recites that the composition further includes a curing agent for the polyfunctional acrylate compound or polyfunctional methacrylate compound. Note, for example, the paragraph bridging pages 10 and 11 of Applicants' specification.

The restriction requirement as set forth in Item 1 on page 2 of the Office Action mailed September 25, 2001, is noted. Applicants affirm their election of

the Group I claims, claims 1-14, drawn to an adhesive/an adhesive-coated metal foil, this election having been made without traverse. The non-elected claims, claims 15-18, are being retained in the above-identified application, subject to the filing of a Divisional application directed to the subject matter thereof in due course.

It is respectfully submitted that all of the newly added claims, claims 19-21, are directed to the elected invention and are to be considered on the merits in the present application.

Applicants respectfully traverse the rejection of their claims under the second paragraph of 35 USC 112, as being indefinite, especially insofar as this rejection is applicable to the claims as presently amended. That is, Applicants' claim 1 now recites that "when" a tracking resistance test "of a cured material of the adhesive composition" is carried out, the adhesive layer dissolves out for the first time when five drops or more of the electrolyte are dropped thereon. It is respectfully submitted that this is a characteristic (e.g., property) of the recited composition and thus is a further recitation in connection with the antecedently recited "adhesive composition", and is sufficiently definite to satisfy the requirements of the second paragraph of 35 USC 112.

Similarly, and as presently amended, it is respectfully submitted that the thermogravimetric analysis after curing "the adhesive composition" constitutes a property of the adhesive composition, and thus further defines the adhesive

composition of claim 3 so as to be sufficiently definite under the requirements of the second paragraph of 35 USC 112.

Applicants have deleted the term "uniformly" from claim 4; accordingly, it is respectfully submitted that the contention by the Examiner that the term "uniformly", in the context of claim 4, "engenders an indeterminacy in scope", is moot.

Applicants have amended claim 6 to recite "the" polyfunctional acrylate compound or "the" polyfunctional methacrylate compound, which has antecedent basis in claim 3. Moreover, recitation to a thermosetting heat-resistant resin in claim 6 has been deleted. Accordingly, any basis of indefiniteness due to recitation of "thermosetting heat-resistant resins" in claim 6 is moot.

As can be seen in the foregoing, Applicants have made a bona fide attempt to amend their claims in order to overcome all issues raised by the Examiner in connection with the second paragraph of 35 USC 112, set forth in Item 10 on page 4 of the Office Action mailed September 25, 2001. If the Examiner is of the opinion that any issues remain under the second paragraph of 35 USC 112, the Examiner is respectfully requested to contact the undersigned, for agreement on appropriate language to overcome any remaining issues under the second paragraph of 35 USC 112. The Examiner is thanked in advance for cooperating with this request.

Applicants respectfully submit that all of the claims now presented for consideration by the Examiner patentably distinguish over the teachings of the references as applied by the Examiner in rejecting the claims as formerly in the application, that is, the teachings of the U.S. patents to Kumakura, et al., No. 5,066,691, to Ishii, et al., No. 5,314,740, to Tracy, et al., No. 5,364,703, to Saida, et al., No. 5,674,611 (Saida '611) to Saida, et al., No. 5,959,256 (Saida '256), to Satoh, et al., No. 6,165,617, and to Nowak, et al., No. 4,194,955, and the English abstract of Japanese Patent Document No. 63-86780, under the provisions of 35 USC 102 and 35 USC 103.

Initially, Applicants thank the Examiner for indicated allowance of claims 7-9. Noting that claim 10 has been amended so as to be dependent on claim 7, it is respectfully submitted that, in addition to claims 7-9, claim 10 and claims dependent thereon are clearly allowable.

With respect to the remaining claims, it is respectfully submitted that the teachings of the applied references would have neither disclosed nor would have suggested such an adhesive composition as in the present claims, having a polyvinyl acetal resin, a thermosetting resin and at least one of a polyfunctional acrylate compound and a polyfunctional methacrylate compound, and wherein the composition has a tracking resistance of a cured material of the adhesive composition as in claim 1, or a thermogravimetric analysis after curing the adhesive composition as in claim 3.

In addition, it is respectfully submitted that the teachings of the applied references would have neither disclosed nor would have suggested the other aspects of the present invention as in the remaining, dependent claims, including (but not limited to) wherein the adhesive composition includes thermosetting resins at least one of which does not react with a polyvinyl acetal resin and which is compatible with the polyvinyl acetal resin (see claim 4); and/or wherein the composition includes thermosetting resins at least one of which does not have an aromatic ring (see claim 5); and/or wherein the polyfunctional acrylate and/or methacrylate compound has two or more acryloyl groups or methacryloyl groups in the molecule (note claim 6; see claim 19); and/or further components of the composition as in claims 12, 13 and 20; and/or wherein the composition is coated as a varnish on one of the surfaces of a metal foil and dried to provide an adhesive-coated metal foil, as in claim 14; and/or the formulation weight ratio of polyvinyl acetal resin to thermosetting resin as in claim 21.

The present invention is directed to an adhesive composition for a metal foil for a printed wiring board of an electric or electronic equipment.

As electronic equipment becomes smaller in size and has increased functions, a printed wiring board to be used therein is required to be of a high density and fine wiring pattern. Due thereto, required levels of solder heat resistance and copper foil-peel resistance is becoming higher; and, also, for electronic equipment to which a high voltage is applied, such as a television set,

tracking resistance is now required. Tracking is a phenomenon in which a carbonized conducting path or a tracking path is, under the present circumstances, disadvantageously formed between portions having a difference in voltage on a surface of an insulating material.

Various adhesives have been proposed in order, for example, to improve various properties thereof; however, such adhesive compositions are unsatisfactory in at least one aspect of adhesiveness, solder heat resistance, peel resistance, tracking resistance, etc.

Against this background, Applicants provide an adhesive composition having good properties of heat resistance, peel resistance, etc., and which also has improved and satisfactory tracking resistance. Applicants have found that utilizing an adhesive composition containing, at the least, a polyvinyl acetal resin, a thermosetting resin and at least one of a polyfunctional acrylate compound and a polyfunctional methacrylate compound, objectives of the present invention are achieved. For example, good tracking resistance can be obtained. Note, for example, the results shown in Tables 1-4 on pages 21, 24, 26 and 28 of Applicants' specification.

JP No. 63-86780 (abstract) discloses an adhesive which includes 100 parts by weight of a thermosetting resin blend of polyvinylbutyral resin and phenol/formaldehyde resin of the resolve type, and 10-200 parts by weight of brominated epoxy resin. The abstract of this Japanese patent document indicates

that the adhesive is used as a base board for electronic parts.

It is respectfully submitted that this Japanese patent document does not disclose, nor would have suggested, an adhesive composition including, inter alia, a polyfunctional acrylate or methacrylate compound as in the present claims. Specifically, as seen particularly in Tables 1-3 of Applicants' specification, if the adhesive composition does not contain any polyfunctional acrylate or methacrylate compound, tracking resistance is poor. Clearly, the Japanese patent document applied by the Examiner would have neither taught nor would have suggested the presently claimed subject matter, including incorporating the acrylate or methacrylate compound in the composition, and advantageous results achieved thereby in, for example, the tracking resistance.

It is emphasized that, as discussed in the foregoing, the Japanese patent document does not provide any description concerning a tracking resistance test and property of tracking resistance as in claim 1, and also does not provide any disclosure in connection with 5% weight loss and carbon residual ratio as in claim 3. It is respectfully submitted that none of the other references as applied by the Examiner, other than Kumakura, et al., provides a description concerning a property of tracking resistance as in claim 1, and none of the other references refer to a tracking resistance test level, or the 5% weight loss and carbon residual ratio in claim 3. For this reason, it is respectfully submitted that the subject matter of claims 1 and 3, and claims dependent thereon, would have neither been

disclosed nor would have been suggested by the teachings of the applied references.

In addition, Kumakura, et al. discloses an adhesive composition for metal-clad laminates, including specific amounts of a polyvinylbutyral having an average polymerization degree of from 500 to 3,000 and a specified degree of butyralization; specific amounts of an epoxidized polybutadiene having a specific number average molecular weight and epoxy equivalent weight; and specific amounts of a hardener for the epoxidized polybutadiene. This patent discloses that the disclosed adhesive composition can increase tracking resistance of metal-clad laminates without decreasing the soldering heat resistance.

It is respectfully submitted that Kumakura, et al. would have neither taught nor would have suggested a composition including a polyfunctional acrylate or methacrylate compound, as in the present claims; nor would have disclosed or suggested advantages of including such compound, and would have neither taught nor would have suggested the present invention.

Ishii, et al. discloses a base board for a printed board panel, permitting easy inspection of a printed circuit by means of a fluorescence-applied circuit pattern inspection machine. The base board is described, for example, from column 1, line 66 to column 3, line 6. This patent discloses use of a specific compound contained in the insulating layer, permitting the easy inspection. This

patent further discloses use of a thermosetting resin impregnated into the substrate or which is used as an adhesive layer to bond a copper foil on an outer layer, particularly preferred being an epoxy resin. See column 4, lines 8-12.

Tracy, et al. discloses production of printed wiring boards using polyetherimide substrates, and improving peel strength of copper foil laminated to polyetherimide substrates. This patent discloses that one side of a copper foil is coated with an adhesive composition, the adhesive composition utilized comprising a blend of a polyvinylbutyral resin, one or more resol resins and an organic solvent. See column 2, lines 5-15. Note also column 2, lines 36-40. Note further column 4, lines 15-19.

Saida '611 discloses an adhesive for use in preparing a laminate for use in making a printed wiring board, the adhesive including specific amounts of an epoxy resin, a polyvinyl acetal resin and a melamine or urethane resin, with specific amounts of the epoxy resin being a rubber-modified epoxy resin. See column 2, lines 57-65. Note also column 3, lines 31-33 and 54-56; column 4, lines 16-19; and the paragraph bridging columns 4 and 5 of this patent. Saida '256 discloses a multilayer printed wiring board for use in making electronic circuits, prepared by providing both the faces of a substrate (e.g., prepreg) respectively with circuits, providing via insulating layers on the outside of the circuits respectively with circuits and then repeating, the insulating layers including specific amounts of an epoxy resin, a polyvinyl acetal resin, and a

melamine or urethane resin, with specific amounts of the epoxy resin being a rubber-modified epoxy resin. See column 2, lines 30-40. Sato, et al. discloses a resin-coated copper foil for use in multilayer printed wiring boards, including a resin composition having specific amounts of an epoxy resin, a polyvinyl acetal resin and a urethane resin, with specific amounts of the epoxy resin being a rubber-modified epoxy resin. Note the paragraph bridging columns 2 and 3 of this patent.

It is respectfully submitted that none of Tracy, et al., Saida '611, Saida '256, Ishii, et al. or Sato, et al. would have disclosed or suggested such an adhesive composition as in the present claims, including, inter alia, the polyfunctional acrylate and/or methacrylate compound; or good tracking resistance achieved when including the polyfunctional acrylate and/or methacrylate compound in the composition. Clearly, these references would have neither taught nor would have suggested the presently claimed subject matter, including advantages thereof.

Nowak, et al. discloses an ultraviolet radiation curable coating composition including a homogenous blend of (1) polyvinylbutyral, (2) vinyl acetate, (3) polymerizable monomers selected from trimethylolpropane triacrylate and pentaerythritol triacrylate, and (4) a photoinitiator. See column 2, lines 16-22. This patent discloses that the composition is a transparent, low viscosity liquid medium transmissive of both visible and ultraviolet light, before

curing, yet which has the appearance and properties of a hard glossy, white opaque-enamel film after coating on a substrate and curing. See column 2, lines 23-31. Note also column 2, lines 46-50 and 58-62.

Nowak, et al. is concerned with ultraviolet curable coating compositions. It is respectfully submitted that this reference does not teach, nor would have suggested, an adhesive composition for a metal foil. Moreover, it is respectfully submitted that the composition of Nowak, et al. does not include a thermosetting resin used according to the present invention, in combination with the other components as in the present claims; and would have neither taught nor would have suggested adhesive compositions as in the present claims, including properties thereof such as tracking resistance and advantages achieved thereby.

In view of the foregoing comments and amendments to the claims, reconsideration and allowance of all claims presently in the application and being considered on the merits therein, in due course, are respectfully requested.

Attached hereto is a marked-up version of the changes made to the specification and claims by the current Amendment. This marked-up version is on the attached pages, the first page of which is captioned "VERSION WITH MARKINGS TO SHOW CHANGES MADE".

To the extent necessary, Applicants petition for an extension of time under 37 CFR 1.136. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to the Deposit Account No.

01-2135 (Case No. 511.37656X00) and please credit any excess fees to such
Deposit Account.

Respectfully submitted,

ANTONELLI, TERRY, STOUT & KRAUS, LLP

A handwritten signature in black ink, appearing to read "William I. Solomon", with a long, sweeping horizontal line extending to the right.

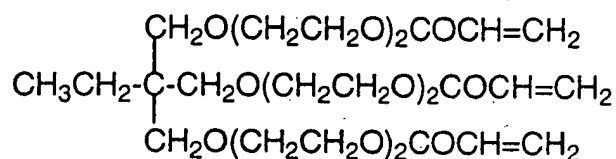
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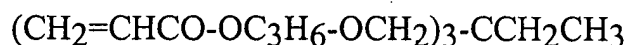
VERSION WITH MARKINGS TO SHOW CHANGES MADE
IN THE SPECIFICATION

Please delete the paragraph bridging pages 4 and 5 of Applicants' specification (that is, the paragraph from page 4, line 17 to page 5, line 4 of text material), and substitute therefor the following new paragraph:

Moreover, the present invention relates to the above-mentioned adhesive composition for a metal foil wherein the polyfunctional acrylate compound or the polyfunctional methacrylate compound having two or more acryloyl groups or methacryloyl groups in the molecule is at least one selected from the group consisting of pentaerythritol triacrylate, trimethylolpropane triacrylate, trimethylolpropane ethyleneoxide triacrylate represented by the formula:



[trimethylolpropane] trimethylolpropane propyleneoxide triacrylate represented by the formula:



added, metal foil peeling strength or solder heat resistance may sometimes be lowered. Also, the metal scavenger is not particularly limited, and is preferably at least one selected from the group consisting of an oxine and its derivatives, a triazine thiol and its derivatives. By adding these compounds, further improvement in tracking resistance can be expected. Moreover, the lubricant is also not particularly limited, and is preferably at least one selected from the group consisting of a silicone compound and a fluorine compound. By adding these compounds, the step of preparing or using the adhesive-coated metal foil can be easily automated.

IN THE CLAIMS

Please cancel claim 2 without prejudice or disclaimer, and amend the claims remaining in the application as follows:

1. (Amended) An adhesive composition for a metal foil which comprises [a material] a polyvinyl acetal resin, a thermosetting resin and at least one of a polyfunctional acrylate compound and a polyfunctional methacrylate compound, wherein when a tracking resistance test of a cured material of the adhesive composition is carried out according to the IEC method by [making a thickness of an adhesive layer 30 to 40 μm ,] using a copper foil pattern with a width of 4 mm [and making a] having electrodes with distance between

electrodes of 0.4 mm, and an adhesive layer having a thickness of 30-40 μ m,
formed on the copper foil pattern by casting the adhesive composition and curing
the same, and dropping an electrolyte on the adhesive layer, then the adhesive
layer dissolves out for the first time when 5 drops or more of [an] the electrolyte
are dropped thereon.

~~23.~~ (Amended) An adhesive composition for a metal foil which com-
prises a polyvinyl acetal resin, [and] a thermosetting resin and at least one of a
polyfunctional acrylate compound and a polyfunctional methacrylate compound,
and in a thermogravimetric analysis after curing the adhesive composition, a 5 %
weight loss temperature of the cured adhesive composition is [being] 290°C or
more and a carbon residual ratio at 650°C of the cured adhesive composition is
[being] less than 1 % by weight.

4. (Amended) The adhesive composition for a metal foil according to
Claim 3, wherein said composition comprises thermosetting resins at least one of
which does not react with a polyvinyl acetal resin and which is compatible with
the polyvinyl acetal resin [uniformly].

6. (Amended) The adhesive composition for a metal foil according to

Claim 4, wherein [said composition comprises thermosetting heat-resistant resins at least one of which is at least one of a] the polyfunctional acrylate compound or [a] the polyfunctional methacrylate compound [having] has two or more acryloyl groups or methacryloyl groups in the molecule.

10.(Amended) [An] The adhesive composition for a metal foil [which comprises a polyvinyl acetal resin, a polyfunctional acrylate compound or a polyfunctional methacrylate compound having two or more acryloyl groups or methacryloyl groups in the molecule and an epoxy resin] according to Claim 7, wherein said polyvinyl acetal resin comprises (a) an acetacetal portion, (b) a butylacetal portion, (c) a vinyl alcohol portion, (d) a vinyl acetate ester portion and (e) an itaconic acid portion having a carboxyl group as a side chain in the weight ratio of

$$0.1 \leq (e)/((a) + (b) + (c) + (d) + (e)) \leq 5,$$

and a number average degree of polymerization of 1,000 to 3,000.

12. (Amended) The adhesive composition for a metal foil according to any one of Claims 1 [to 11] and 3-11, wherein said composition further comprises at least one filler selected from the group consisting of silica, alumina, aluminum hydroxide, magnesium hydroxide, talc and organic filler.

13. (Amended) The adhesive composition for a metal foil according to any one of Claims 1 [to 11] and 3-11, wherein said composition further comprises at least one of an antioxidant, a metal scavenger or a lubricant.

14. (Amended) An adhesive-coated metal foil which is obtained by coating the adhesive composition for a metal foil according to any one of Claims 1 [to 11] and 3-11, as a varnish on one of the surfaces of the metal foil and drying.